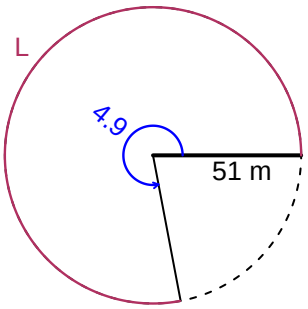
Name: Date:

## Trig Final (SLTN v659)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 51 meters. The angle measure is 4.9 radians. How long is the arc in meters?

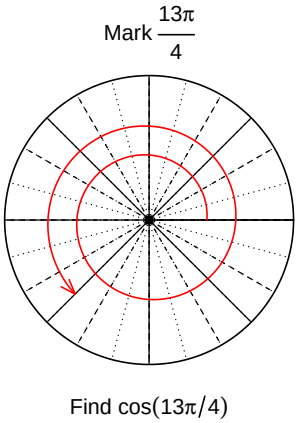



$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

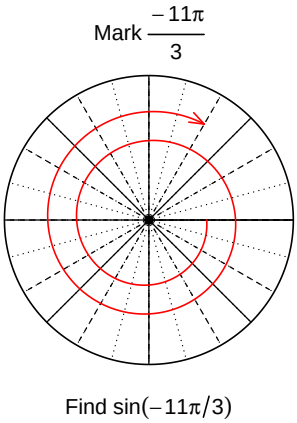
$L = 249.9$ meters.

### Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{13\pi}{4}\right)$ and $\sin\left(\frac{-11\pi}{3}\right)$ by using a unit circle (provided separately).




Find $\cos(13\pi/4)$




Find $\sin(-11\pi/3)$

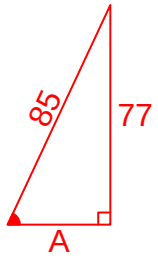
$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-11\pi/3) = \frac{\sqrt{3}}{2}$

**Question 3**

If $\sin(\theta) = \frac{-77}{85}$, and $\theta$ is in quadrant III, determine an exact value for $\tan(\theta)$.

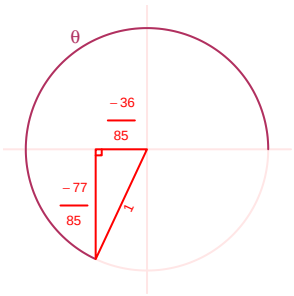
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.




Solve the Pythagorean Equation

$$A^2 + 77^2 = 85^2$$
$$A = \sqrt{85^2 - 77^2}$$
$$A = 36$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.




$$\tan(\theta) = \frac{\frac{-77}{85}}{\frac{-36}{85}} = \frac{77}{36}$$

**Question 4**

A mass-spring system oscillates vertically with a midline at $y = 4.66$ meters, a frequency of 7.96 Hz, and an amplitude of 2.5 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height ($y$ in meters) as a function of time ($t$ in seconds).

Any of these equations would get full credit.

$$y = 2.5\sin(2\pi 7.96t) + 4.66$$

or

$$y = 2.5\sin(15.92\pi t) + 4.66$$

or

$$y = 2.5\sin(50.01t) + 4.66$$